Rhamnus cathartica

Rhamnus cathartica, the **European buckthorn**,[3] **common buckthorn**, **purging buckthorn**, or just **buckthorn**, is a species of small tree in the flowering plant family Rhamnaceae. It is native to Europe, northwest Africa and western Asia, from the central British Isles south to Morocco, and east to Kyrgyzstan.[4] It was introduced to North America as an ornamental shrub in the early 19th century or perhaps before, and is now naturalized in the northern half of the continent, and is classified as an invasive plant in several US states[5][6][7] and in Ontario, Canada.[8]

Fruit

Description

Rhamnus cathartica is a deciduous, dioecious shrub or small tree growing up to 10 metres (33 ft) tall, with grey-brown bark and often thorny branches. The leaves are elliptic to oval, 25–90 mm (1–$3^{1}/_{2}$ in) long and 12–35 mm ($^{1}/_{2}$–$1^{3}/_{8}$ in) broad; they are green, turning yellow in autumn, have toothed margins, and are arranged somewhat variably in opposite to subopposite pairs or alternately. The flowers are yellowish-green with four petals; they are dioecious and insect pollinated and bloom in April–June.[9] The fruit is a globose black drupe, 6–10 mm ($^{1}/_{4}$–$^{3}/_{8}$ in) across, and contains two to four seeds.

In addition to the kindred *Frangula alnus*, *Rhamnus cathartica* may be visually confused with a plant of another family, *Cornus sanguinea*.[10]

The species was originally named by Carl Linnaeus as *Rhamnus catharticus*, but this spelling was corrected to *cathartica* as the genus name *Rhamnus* is treated as being of feminine gender.[11]

Toxicity

The seeds and leaves are mildly poisonous for humans and most other animals, but are readily

eaten by birds, who disperse the seeds in their droppings.[12][13] The toxins cause stomach cramps and laxative effects that may function in seed dispersal. The chemical compounds responsible for this laxative effect are anthraquinone[14] and emodin. The species name *cathartica* and the common name *purging buckthorn* refer to this effect.

In 1994, *R. cathartica* was implicated in the outbreak of an idiopathic neurological disease in horses, although no causative agent was officially identified. In trials where rodents were fed the leaves and stems of *R. cathartica*, glycogen metabolism became abnormal and glycogen deposits formed in the cytoplasm of liver cells. Abnormalities in glycogen metabolism lead to diabetes in humans.[15]

Ecology

Rhamnus cathartica is shade-tolerant, moderately fast-growing and short-lived. It is a food plant of the brimstone butterfly, *Gonepteryx rhamni*. The sulphur-yellow males are indicative of the presence of this species or of its alternative host, *Frangula alnus*.

Rhamnus cathartica is the alternate host for the rust disease of cereals caused by *Puccinia coronata*. Crown rust fungus results in leaf damage and reductions in photosynthesis during its transit in this species.[16] *Rhamnus cathartica* is also the primary overwintering host in North America for a significant agricultural pest of soybeans, the soybean aphid.[17]

Allelopathy

Secondary compounds, particularly emodin, have been

Rhamnus cathartica

Conservation status

Least Concern (IUCN 3.1)[1]

Scientific classification

Kingdom:	Plantae
Clade:	Tracheophytes
Clade:	Angiosperms
Clade:	Eudicots
Clade:	Rosids
Order:	Rosales
Family:	Rhamnaceae
Genus:	*Rhamnus*
Species:	***R. cathartica***

Binomial name

Rhamnus cathartica

L.

Synonyms[2]
Cervispina cathartica (L.) Moench

found in the fruit, leaves, and bark of the plant, and may protect it from insects, herbivores and pathogens.[18] The emodin present in *R. cathartica* fruit may prevent early consumption, as it is found most in unripe fruits, which allows seeds to reach maturity before being dispersed. Birds and mice significantly avoid eating unripe fruits, and if forced to ingest emodin or unripe fruit, the animals regurgitate the meal or produce loose, watery stools.[18] *Rhamnus cathartica* is a constitutive isoprene emitter [16]

Allelopathic effects of exudates from *R. cathartica* leaf litter, roots, bark, leaves and fruit may reduce germination of other plant species in the soil. Soils in buckthorn-dominated areas are higher in nitrogen and carbon than normal soils, which speeds up decomposition rates of leaf litter.[19] This can result in bare patches of soil being formed and *R. cathartica* performs well in such disturbed habitats, so this may be adaptive for the setting of its seed.[18]

Invasive species

The species is naturalised and invasive in parts of North America.[20][18][21] *Rhamnus cathartica* has a competitive advantage over native trees and shrubs in North America because of root competition, the shade it produces,[22] and it leafs out before native species.[23] Of the annual carbon gain in *R. cathartica*, 27–35% comes from photosynthesis occurring before the leaves of other plants emerge.[14] Soil in woodlands dominated by *R. cathartica* was higher in nitrogen, pH and water content than soil in woodlands relatively free of *R. cathartica*,[19][24] probably because *R. cathartica* has high levels of nitrogen in its leaves [25] and these leaves decompose rapidly.

Rhamnus cathartica is also associated with invasive European earthworms (*Lumbricus* spp.) in the northern Midwest of North America.[26] Removing *R. cathartica* led to a decrease of around 50% in the biomass of invasive earthworms.[27]

Soils enriched by extra nitrogen from decayed buckthorn leaves and additional earthworm activity have a negative impact on North American forest ecosystems: "Invasive earthworms, which need rich litter, break [buckthorn leaves] down rapidly, destroying beneficial fungi and exposing bare soils in the process. These soils provide ideal conditions for buckthorn germination and seedling growth but many native trees and shrubs need the beneficial fungi and

will not reproduce without it."[25]

Common buckthorn can be found in most northern states of the United States and it is particularly prevalent in the Great Lakes states of Minnesota, Wisconsin, and Michigan. A current map of its distribution can be found at Early Detection and Distribution Mapping System (EDDmapS).[28] This species is largely bird-dispersed, but only a subset of bird species that eat the fruit are competent dispersers.[29] It is winter hardy in USDA zones: 3 to 8.[30] It is a prohibited species in a few US states; Minnesota lists it as a Restricted noxious weed making it illegal to import, sell, or transport the plant,[31] Connecticut, Iowa, Massachusetts, New Hampshire, also restrict or ban the plant, and Vermont lists it as a Class B noxious weed.[32]

Control

Cutting board made from common buckthorn and Norway maple

Rhamnus cathartica is difficult to control in its invasive range, because it sprouts vigorously and repeatedly from the root collar following cutting, girdling or burning.[33] Herbicide application to newly cut stumps is a popular and effective control method, but seeds stay viable in the soil for several years before sprouting, so repeated treatments and long-term monitoring of infested areas is required.[34] Triclopyr and picloram and their derivatives have been found to be effective chemical means of control. Roundup can be used but is less reliable.[14] An application of these chemicals in early winter reduces the risk of negatively affecting non-target species, as most have gone dormant by this time. It is also easier to spot infestations at this time of the year, as the leaves of *R. catharticus* stay out an average of 58 days longer than native plants.[14]

Mechanical control methods such as pulling and chopping of plants are more environmentally friendly, but also very time-consuming. Plants with stems less than half an inch in diameter or less than a metre (3') tall can easily be pulled, but pulling risks disturbing the roots of adjacent, native plants and harming them as well.[34] Propane weed-torches may also be used to kill seedlings, which will generally not resprout if burned in spring or early summer.[14]

Uses

The bark and fruit of *Rhamnus cathartica* were used as a purgative in traditional medicine,[35] but is generally no longer used for this purpose on account of the fruit's violent action and potentially dangerous effects on the body.[36] It also appeared to be routinely used as a purgative in some monastic settings, as was clear from the latrine pits of the Benedictine Abbey at St Albans excavated in the 1920s, where great numbers of buckthorn seeds were found mixed up with the fragments of cloth used by the monks as lavatory paper[37]

The wood is hard and dense, and the bark yields a dye.[35]

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Further reading

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External links

- Invading Species.com (http://www.invadingspecies.com/common-buckthorn/) , Biological and Control Information from the Ontario Invading Species Awareness Program
- Most Unwanted – Common Buckthorn (https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/unwantedlettersBuckthornFINAL.pdf) , Ontario Invasive Species Council

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- Species Profile - Common Buckthorn (*Rhamnus cathartica*) (https://www.invasivespeciesinfo.gov/terrestrial/plants/common-buckthorn) , National Invasive Species Information Center, United States National Agricultural Library.
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